

Patterns, Fractals and Attractors

Published in 2000; updated on May 25, 2017

Please note: Best viewed at 1280 x 1024 resolution.

Texts in blue italics are "*quotes*."

Texts in blue underline are links.

Texts with **N** signify new or updated text.

Texts in black on white background are my texts, including My Fragments (MF#).

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Pattern Quotes

Norbert Wiener (1954). "*The Human Use of Human Beings*." Da Capo Press, p. 21, 95, 96.

"Messages are themselves a form of pattern and organization."

"Organism is opposed to chaos, to disintegration, to death, as message is to noise."

"A pattern is a message, and may be transmitted as a message."

"We are but whirlpools in a river of ever-flowing water."

"We are not stuff that abides, but patterns that perpetuate themselves."

"It is the pattern maintained by this homeostasis, which is the touchstone of our personal identity."

•

Carl G. Jung (1964). "*Man and His Symbols*." Aldus Books-Jupiter Books, p. 308.

"...our conscious representations are sometimes ordered (or arranged in a pattern) before they have become conscious to us."

•

Ni Hua-Ching (1983). "*The Book of Changes and the Unchanging Truth*." Seven Star Communications, Santa Monica, p. 23.

☯ *"All Movement, all change, is a pattern of the interaction of yin and yang."*

•

Rucker, R. (1987). "*Mind Tools: The Five Levels of Mathematical Reality*." Houghton Mifflin Company, Boston, p. 3.

"Mathematics is the study of pure pattern, and everything in the cosmos is a kind of pattern."

•

Rolf, I.P. (1989). "*Rolfing*." Healing Art Press, p. 15.

"As in all matter organized into biological units, there is a pattern, an order, in human bodies."

•

Gleick, J. and Porter, E. (1990). "*Nature's Chaos*." Little, Brown and Company, p. 35.

"The human mind is a powerful pattern-recognition machine, more powerful than any computer yet built. Sometimes it is too powerful; it detects patterns where they do not really exist."

•

Hardy, G.H. (1992). "*Mathematician's Apology*." Canto ed., Cambridge University Press, p. 84.

"A mathematician, like a painter or a poet, is a maker of patterns. If his patterns are more permanent than theirs, it is because they are made with ideas."

•

Casti, L.J. (1992). "*Reality Rules I: Picturing the World in Mathematics - The Fundamentals*." John Wiley, p. 229.

"We can think of the evolution of a cellular automaton as a pattern-recognition process, in which all initial configurations in the basin of attraction of a particular attractor are thought of as instances of some pattern with the attractor being the 'archetype' of this pattern. Thus, the evolution of the different state trajectories toward this attractor constitutes recognition of the pattern."

•

Stewart (1995). "*Nature's Numbers: Discovering Order and Pattern in the Universe*." Phoenix. p. 1, 1, 3, 16, 21, 142, 168, respectively.

"We live in a universe of patterns."

"Nature's patterns are not just there to be admired, they are vital clues to the rules that govern natural processes."

"Patterns possess utility as well as beauty."

"Each of nature's patterns is a puzzle, nearly always a deep one."

"Mathematics is the science of patterns, and nature exploits just about every pattern that there is."

"Even when the consequence of natural laws seem to be patternless, the laws are still there and so are the patterns."

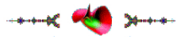
"Nature's patterns are 'emergent phenomena.' They emerged from an ocean of complexity ..."

•

Capra, F. (1996). "*The Web of Life*." Anchor Books, p. 80.

"Understanding of life begins with the understanding of patterns."

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- [Devlin](#), K. (1998). "*The Language of Mathematics: Making the Invisible Visible*." Freeman / Owl Books, p. 3.
"...mathematics is the science of patterns."
-
- [Sprott](#), J.C. (2003). "*Chaos and Time-Series Analysis*." Oxford UP, p. 272.
"Fractals are to chaos what geometry is to algebra."
-
- [Mandelbrot](#), B.B. and Hudson, R.L. (2004). "*The (Mis) Behavior of Markets*." Basic Books, p. 21.
"Patterns are the fool's gold of financial markets."
-
- [Pickover](#), C.A. (Ed.) (2005). "*The Pattern Book: Fractals, Art and Nature*." World Scientific, p. 403
[Yuzo Nakano](#): "*I did my research as an artist, not as a scientist... the reality of nature is the shape of patterns formed by the continual oscillation and transformation of energy.*"
-
- Graham, B. (2006). "*The Intelligent Investor*." Revised edition, Updated with new commentary by Jason Zweig. Collins, p. 220.
"Humans are pattern-seeking animals."
-
- [Wolfram](#), S. (2009). "*Cellular Automata as Models of Complexity*." (1984).
"Natural systems from snowflakes to mollusk shells show a great diversity of complex patterns. The origins of such complexity can be investigated through mathematical models termed 'cellular automata.'"
- Pickover, C.A. (2015). "*The Mathematics Devotional*." Sterling, New York, p. 1.
"Some of the individuals who are quoted have likened mathematicians to artists who seek patterns and who have aesthetic perspectives on their subject matter."



My Fragments - From My Personal Point of View

For the complete list, please see [Tamari](#).

MF1: *Fractals relate to attractors like cobblestones in roads.* Added 1 January 2000.

MF3: **Fractalization of the Language I.** Added 21 April 2002.

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*A **word** is worth a thousand ...?*

*"A **picture** is worth a thousand **words**,"* as the old saying goes. 

But sometimes: *One good **sentence** is worth a thousand **pictures**.*
 for example: "*A **picture** is worth a thousand **words***" (like a [Möbius strip](#)).

*A **metaphor** is worth a thousand **pictures**.*

*An **allegory** is worth a thousand **metaphors**.*

*A **?** is worth a thousand **allegories**.*

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MF10: **Fractalization of the Language II.** Added 15 November 2009.

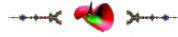
*"Between any two 'points' in a set of points" or numbers, words, sentences, paragraphs, thoughts, etc.,
 "we can put another point" or numbers, words, sentences, paragraphs, thoughts, etc.,
 and if the set is not big enough, we can add another 'point.'*

[Wisława Szymborska](#) (2005) "Colon" "*The nightmare of the poet*" (trans. by Deena Land, 15 July 2010).

"An allocated number of words. Never a wordless one."

*An unlocated number of words, never a needless one
Meaning - no poetry
And no philosophy and no religion."*

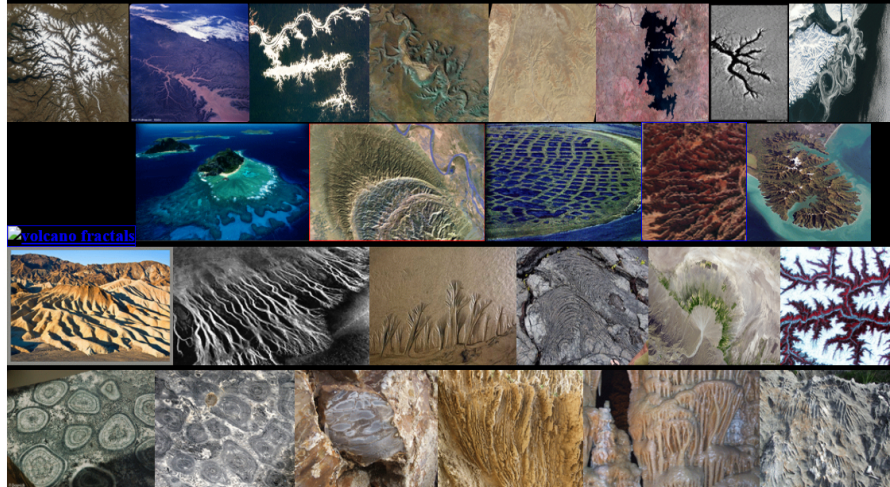
MF9: 'Fractals and chaos is like sewing and cooking.' Added 28 March 2009.



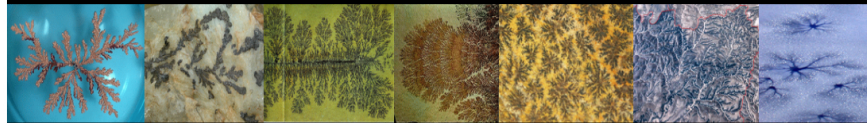
Patterns

God is an economical architect. He visited our earth, left a number of "master plans" that would continue operating on their own based on unknown principles (including a feedback mechanism), and then departed for subsequent tasks. Now we must decipher them using the "tools" at our disposal – tools created in His image, according to His principles and His plans. These tools are: our intellect, our imagination and our skills, as well as our predisposition for language, metaphor and mathematics. Following is an attempt to compile, and as far as possible to classify, a collection of the patterns around us, which the author believes will help us understand, when the time comes, the master plans that He bequeathed to us, and that depict the "laws" in effect (like scaffolding that is removed after a building is constructed). For an example of this kind of attempt, see Speculation 1.

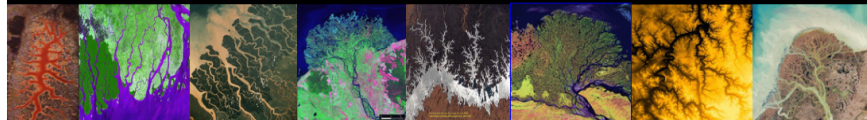
Patterns in Nature:



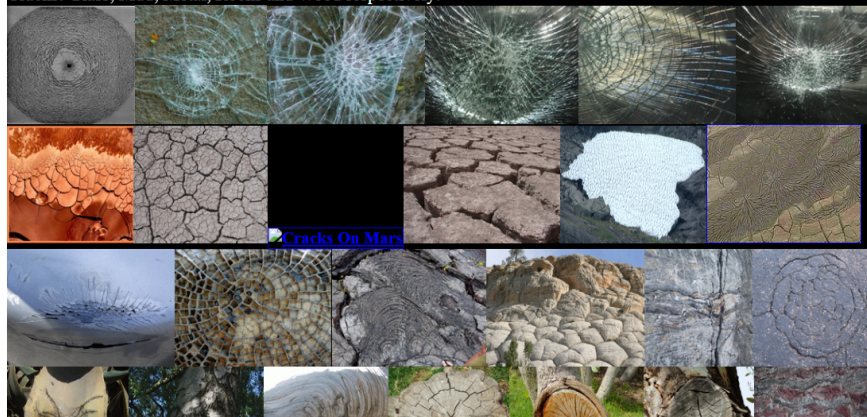
Dendrites:



Rivers and Deltas:

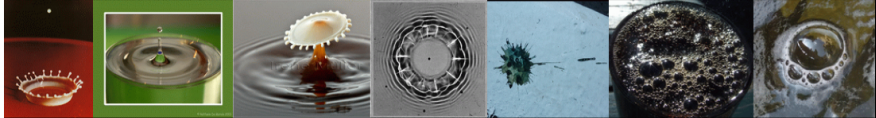


Cracks: Glass, Mud, Metal, Rocks and Wood respectively:

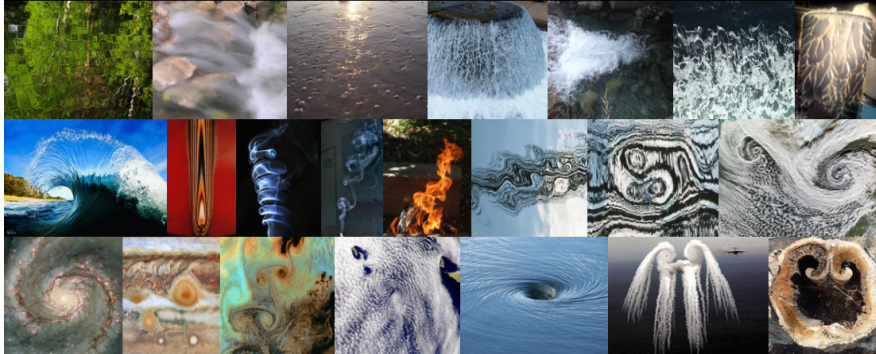




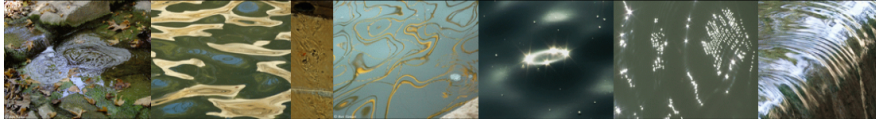
Drops, Splashes and Bubbles:



Currents, Whirlpools, Swirls, Vortices and Symmetry:



Short Movies of Water Patterns: Video: [Ben](#) [Tamari](#), Music: Mordechai Cohen



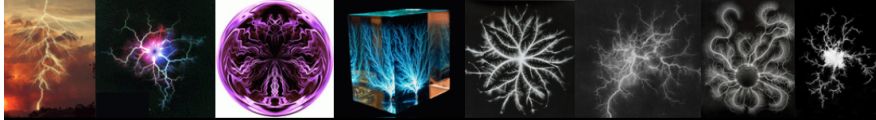
Clouds:



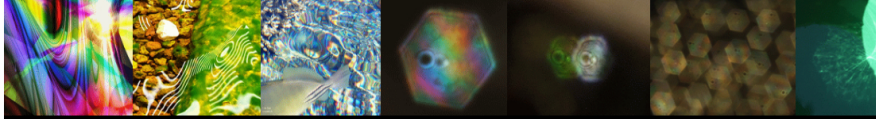
Multifractals:



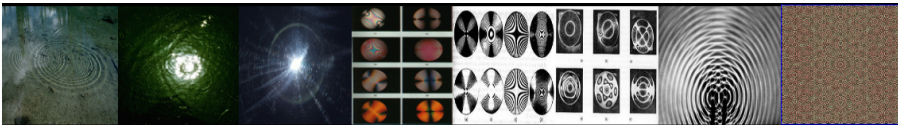
Electricity:



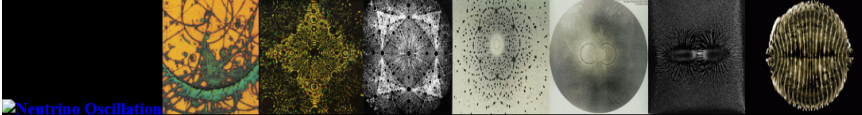
Diffractions:



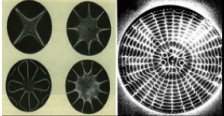
Interferences:



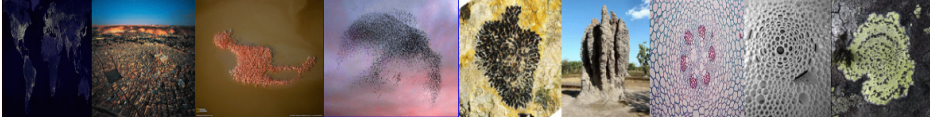
Vibrations and Cymatics:



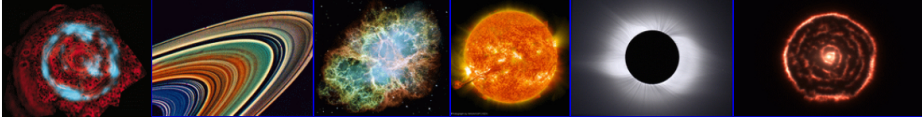
Neutrino Oscillation



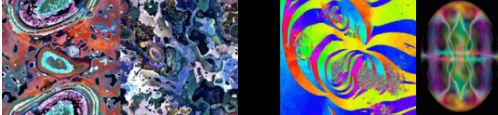
Self-Organization, Emergence and Complexity:



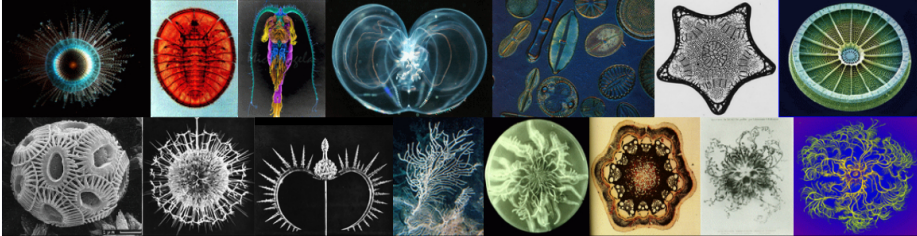
Astronomy:



Cellular Automata, Nano-technology:



Sea Creatures, Diatoms and Microscopic Fungi:



Shells:

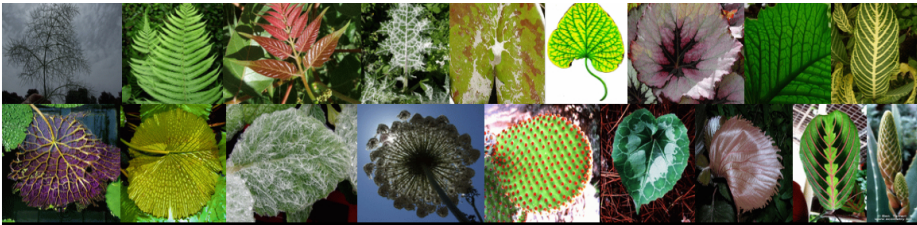


Trees:



Leaves:





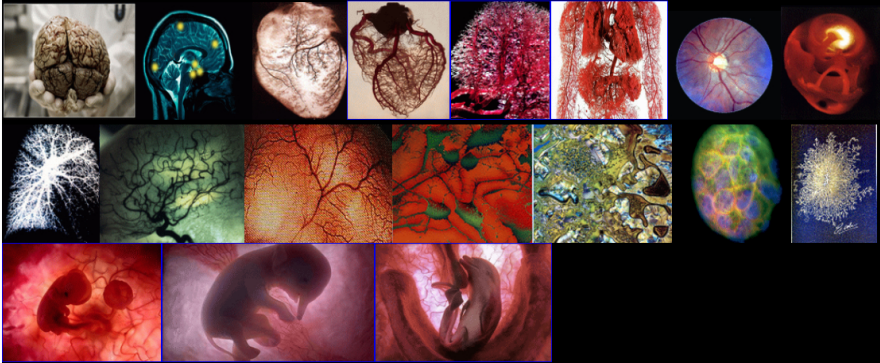
Plants:



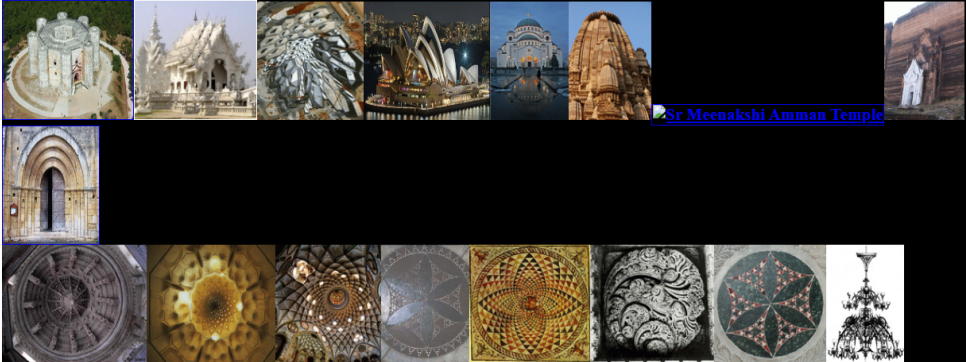
Animals:



The Human Body and...:



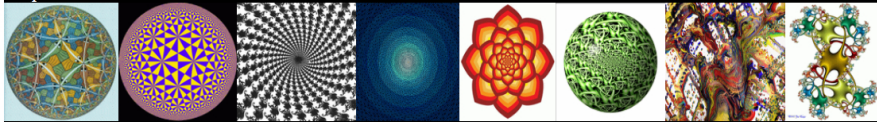
Architecture:



Arts:



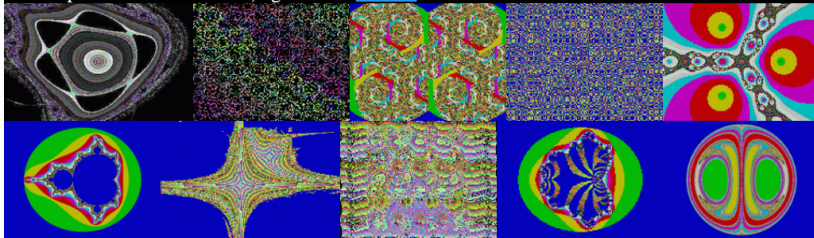
Graphics:



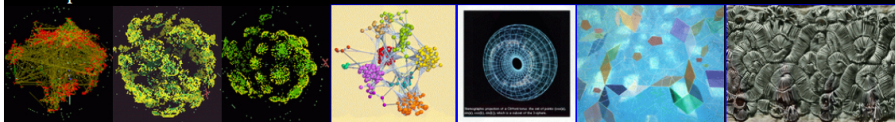
Religion and Symbols:



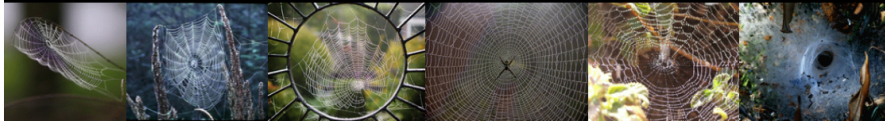
2D Computer-Generated Fractals, figured with [FractInt](#) software.



3D Computer-Generated Fractals and more:

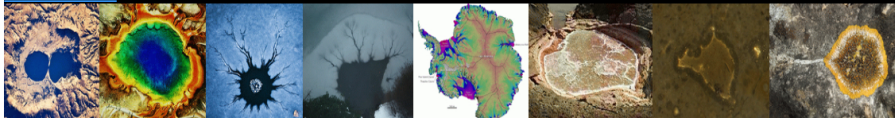


Cobwebs:



Near-Mathematical Creatures in Nature:

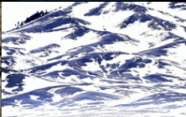
[Mandelbrot Set](#):



[Mobius Strip](#):



[Sierpinski Fractal](#):

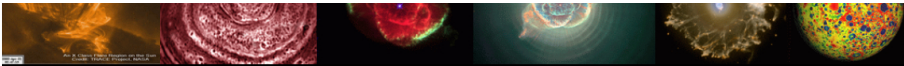


Natural Fractals:

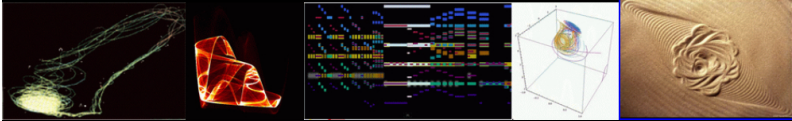


Natural Attractors:

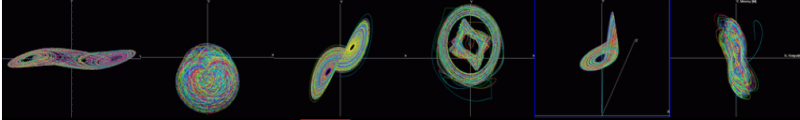




Attractors in the Brain, Music, Economics and Earthquakes:



3D Computer-Generated Attractors:



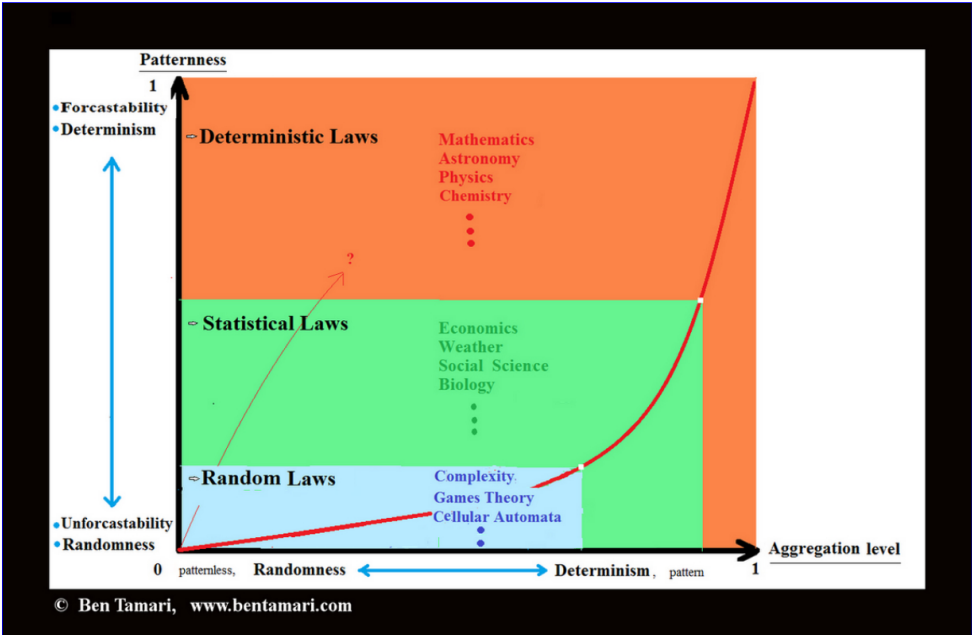
Chua, Ikeda, Lorenz, Pickover, Rossler and **Tamari** attractors respectively, figured with **Eco2** software.

Humor in Attractors and Fractals:



Speculation 1, 19 October 2013 On patternness (y) as a function of aggregation [$y = f(x)$].

The Three Laws' regimes: The **Random** laws (gas-like), the **Statistical/chaotic** laws (liquid-like) and the **Deterministic** laws (solid-like), RSD.



Examples:

Deterministic Laws: [Lagrangian](#) and [Lorentz transformations](#)

Statistical Laws: Weather - [Lorenz Attractor](#) and Economics - [Tamari Attractor](#)

Random Laws: Cellular Automata - [Rule 110 of Stephan Wolfram](#) and [Games of Life](#)

Scott, A. C. (2007). "The Nonlinear Universe: Chaos, Emergence, Life." Springer-Verlag. p. 7

"Just as supercooled water, resting quietly in its fluid state, may experience the onset of a phase change during which it suddenly turns to ice, collective social phenomena can unexpectedly arise, sweeping away previous assumptions and introducing new perspectives."

Puetz, S. J. (2009). "The Unified Cycle Theory: How Cycles Dominate the Structure of the Universe and Influence Life on Earth." Outskirts Press, Inc. Denver, Colorado. p. 35

N "In essence, the size of a collection of mass determines its properties."



Speculation 2 January 2017 Scientific Unifier.

When the world is united, everything is clear, stable and predictable; but when it is fragmented, all becomes foggy and chaotic.

What a pity that the authors of "The Nobel Factor: The Prize in Economics, Social Democracy, and the Market" didn't read my article, "Conservation and Symmetry Laws and Stabilization Programs in Economics," before writing their book. The authors, Avner Offer and Gabriel Söderberg, probably would have changed some of their words or ideas.

Unfortunately, I don't have a copy of the book but I did skim over their main arguments. Here is my response: Economics is physics with pricing, or physics is economics without the pricing. All the rest is just commentary.

Moreover, since the economic cosmos (in its mathematical formulation; see the attached picture) contains two fundamental principles of nature – **the law of conservation** (the first two equations: the rotational functions) and the **law of reaction** (the third equation: the reaction/feedback/potential/height/evolution...function) – together these three equations may be used as a 'scientific unifier' and a means of describing each branch of science. These three fundamental equations comprise an **attractor**, whose advantage lies in being slow, linear and predictable in certain areas, and fast, chaotic and unpredictable in other areas.

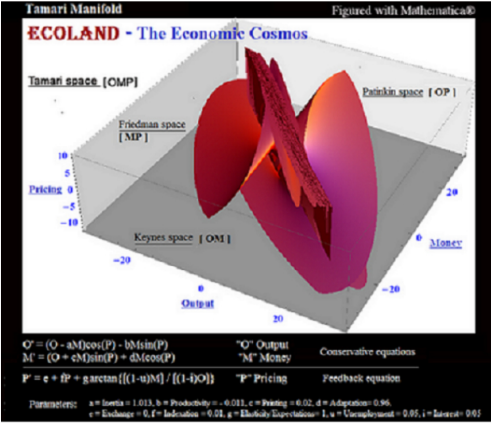
In other words, when the world is united, everything is clear and stable; but when it is fragmented, all becomes foggy and chaotic.

For example, in physics: the first two equations describe the 'rotational' nature of space and time (output and money in the economic space), whereas in the third equation the reaction function of gravity (pricing in the economic space), we can apply Newton's law of attraction. Einstein's version is found in the rotational aspect of the first two equations (that ensure conservation).

In my opinion, the more we know how to formulate economic sentences in mathematic notation, the better; and this, to the best of my understanding, is the goal of the Nobel Prize in Economics. The prize exudes the flavor and orientation of the free market, which is what guarantees fairness and economic effectiveness. That's the most that can be done to promote knowledge and understanding in economics.

It is possible to fail with capitalism and to succeed with communism, and vice versa, but nothing can be done without the free market. Freedom guarantees the effective functioning of money, which is the key to a prosperous society.

Unfortunately, for right-wingers (Reagan, Thatcher, Netanyahu, Trump and their devotees), the 'free market' means free competition, in the sense of 'capitalism-for the poor and socialism-for the rich,' or, in political terms, less regulation and taxation, because, they claim, 'wealth trickles down,' even though they know the current flows upward.



Offer, A. and Söderberg, G. (2016). "The Nobel Factor: The Prize in Economics, Social Democracy, and the Market." Princeton University Press.



Books and Articles:

Adam, J.A. (2003). "Mathematics in Nature: Modeling Patterns in the Natural World." Princeton UP.

Anderson, D.M. (1961). "Elements of Design." Holt, Rinehart and Winston.

Offer, A. and Söderberg, G. (2016). "The Nobel Factor: The Prize in Economics, Social Democracy, and the Market." Princeton University Press.

Barnsley, M.F. (1993). "Fractals Everywhere." 2nd ed. Academic Press.

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Briggs, J. (1992). "Fractals: The Patterns of Chaos." Simon and Schuster.

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Goldstein, D. (2001). "The Chaos Machine." Princeton UP.

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Hemenway, P. (2005). "Divine Proportion: Phi in Art, Nature, and Science." Sterling Pub., NY.

Janus, H. (1957). "Nature as Architect." Frederick Ungar Pub., NY.

Mandelbrot, B.B. (1977) "Fractals; Form, Chance, and Dimension." Freeman.

[Mandelbrot, B.B. \(1983\). "The Fractal Geometry of Nature." Freeman.](#)

Mandelbrot, B.B. (2004). "Fractals and Chaos." Springer.

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Peitgen and Saupe (1992). "Chaos and Fractals, New Frontiers of Science." Springer-Verlag.

[Pickover, C.A. \(Ed.\). \(2005\). "The Pattern Book: Fractals, Art and Nature." World Scientific.](#)

[Pickover, C.A. \(2009\). "The Math Book: From Pythagoras to the 57th Dimension, 250 Milestones in the History of Mathematics." Sterling.](#)

[Sprott, J.C. \(1993\). "Strange Attractors: Creating Patterns in Chaos." M.T. Books, NY.](#)

[Stewart, I. \(1995\). "Nature's Numbers: Discovering Order and Pattern in the Universe." Phoenix.](#)

Wille, L.T. (Ed.) (2004). "New Directions in Statistical Physics: Econophysics, Bioinformatics, and Pattern Recognition." Springer.

Wolfram, S. (2002). "A New Kind of Science." Wolfram Media, Inc.

Links

<http://easyweb.easynet.co.uk/~ianjy/patterns/index.htm>

<http://beautifulchemistry.net/>

<http://www.bathsheba.com/>

<http://www.bugman123.com/index.html>

<https://www.flickr.com/photos/origomi/sets/72157601323433758/>

<http://fractalfoundation.org/>

<http://fractalarts.com/>

www.fractalus.com

http://www.nysm.nysed.gov/virtual/collections/splendor_in_stone/index.html

<http://neurofuture.blogspot.com/2007/02/cellular-automata.html>

<http://news.bbc.co.uk/2/hi/science/nature/7617191.stm>

<http://www.patternsinnature.org/index.html>

<http://photography.nationalgeographic.com/photography/photogalleries/patterns-in-nature>< /p>

<http://pespmc1.vub.ac.be/Photos/Cracks.html>

<http://pespmc1.vub.ac.be/Photos/patterns.html>

<http://polymer.bu.edu/ogaf/>

<http://www.josleys.com/index.php>

<http://www.tomshannon.com/>

http://www.youtube.com/watch_popup?v=RWgg5-kUSho&vq=medium

http://www.physlink.com/education/essay_weinberg.cfm

<https://www.youtube.com/watch?v=rENjyRwxpHo>

Software:

<http://www.fractalsciencekit.com/>

<http://www.fractint.org/>

<http://www.chaoscope.org/>